PARISHARM 2024

Relation and Functions

DPP-01

1. The relation R defined on the set $A = \{1, 2, 3, 4, 5\}$ by $R = \{(x, y) : |x^2 - y^2| < 16\}$, then:
(1) $R = \{(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)\}$
(2) $R = \{(2, 2), (3, 2), (4, 2), (2, 4)\}$
(3) $R = \{(3, 3), (4, 3), (5, 4), (3, 4)\}$
(4) None of these

2. If $A = \{1, 2, 3\}$ and $R_1 = \{(1, 2), (3, 2), (1, 3)\}$ $R_2 = \{(1, 3), (3, 6), (2, 1), (1, 2)\}$, then:
(1) R_1 is a relation and R_2 is not a relation on A
(2) R_1 and R_2 both are relation on A
(3) R_1 and R_2 both are not relation on A
(4) None of these

3. Define a relation R on set $A = \{2, 3, 5, 6, 10\}$ as xRy if '$x < y$ and x divides y', then the domain of relation is:
(1) $\{2, 3, 5, 6, 10\}$
(2) $\{2, 3, 5\}$
(3) $\{2, 3, 5, 6\}$
(4) $\{2, 5, 10\}$

4. Let R be a relation in N defined by $R = \{(1 + x, 1 + x^2): x \le 5, x \in N\}$. Which of the following is false?
(1) $R = \{(2, 2), (3, 5), (4, 10), (5, 17), (6, 25)\}$
(2) Domain of $R = \{2, 3, 4, 5, 6\}$
(3) Range of $R = \{2, 5, 10, 17, 26\}$
(4) None of these

5. The domain and range of the relation R given by $R = \{(x, y) : y = x + \frac{6}{x}$; where $x, y \in N$ and $x < 6\}$, respectively, is:
(1) $\{1, 2, 3\}, \{7, 5\}$
(2) $\{1, 2\}, \{7, 5\}$
(3) $\{2, 3\}, \{5\}$
(4) $\{2, 3\}, \{5, 3\}$

6. Consider the following with regard to a relation R on a set of real numbers defined by xRy if and only if $3x + 4y = 5$. Consider the following three statements:
(i) $0\ R\ 1$ (ii) $1\ R\ \frac{1}{2}$ (iii) $\frac{2}{3} R \frac{3}{4}$
Which of the above are correct?
(1) i and ii only
(2) i and iii only
(3) ii and iii only
(4) i, ii and iii

7. A relation R is defined from $\{2, 3, 4, 5\}$ to $\{3, 6, 7, 10\}$ by $xRy \Leftrightarrow x$ is relatively prime to y. Then domain of R is:
(1) $\{2, 3, 5\}$ (2) $\{3, 5\}$
(3) $\{2, 3, 4\}$ (4) $\{2, 3, 4, 5\}$

8. If $R = \{(x, y) \mid x, y \in Z, x^2 + y^2 \le 4\}$ is a relation on Z, then domain of R is:
(1) $\{0, 1, 2\}$
(2) $\{0, -1, -2\}$
(3) $\{-2, -1, 0, 1, 2\}$
(4) None of these

9. Let A be the set of first ten natural numbers and let R be a relation on A defined by $(x, y) \in R \Leftrightarrow x + 2y = 10$, i.e., $R = \{(x, y) : x \in A, y \in A$ and $x + 2y = 10\}$. Then the domain and range of R is
(1) $\{2, 4, 6, 8\}, \{4, 3, 2, 1\}$ respectively
(2) $\{4, 3, 2, 1\}, \{2, 4, 6, 8\}$ respectively
(3) $\{1, 2, 3, 4\}, \{1, 2, 3, 4\}$ respectively
(4) None of these

10. If R is a relation from a set A to set B, then:
(1) $R \subset B \times A$ (2) $R \subset A \times B$
(3) $R = A \times B$ (4) $A \times B \subset R$

11. Let $A = \{4, 5, 7\}$ and $B = \{2, 4, 6\}$ be two sets and let a relation R be a relation from A to B is defined by $R : \{(x, y) : x < y, x \in A, y \in B\}$ then the difference between the sum of elements of domain and range of R is:

(1) 2 (2) 3

(3) 4 (4) 5

12. Let $A = \{2, 3, 4, 5\}$ then how many relations can be defined on set A?

(1) $(16)^2$

(2) $(2)^{14}$

(3) $(16)^4$

(4) $(4)^{16}$

Answer Key

1.	**(4)**	**7.**	**(4)**
2.	**(1)**	**8.**	**(3)**
3.	**(2)**	**9.**	**(1)**
4.	**(1)**	**10.**	**(2)**
5.	**(1)**	**11.**	**(2)**
6.	**(3)**	**12.**	**(3)**

Hints & Solution

1. **(4)**

The relation of the option (1) does not contain ordered pairs (4, 5), (5, 4). Similarly, others can be checked.

2. **(1)**

Given, $A = \{1, 2, 3\}$

$R_1 = \{(1, 2), (3, 2), (1,3)\}$

$R_2 = \{(1, 3), (3, 6), (2, 1), (1, 2)\}$

Clearly R_1 is one many relation as well as many one but R_2 is one-many as $(1, 3), (1, 2) \in R_2$.

But $6 \notin A$, implies R_2 is not a relation on A.

3. **(2)**

Given $A = \{2, 3, 5, 6, 10\}$ and

'xRy if $x < y$ and x divides y'; $R \subseteq A \times A$

$\Rightarrow$ $R = \{(2, 6), (2, 10), (3, 6), (5, 10)\}$

Domain of R = {2, 3, 5}

4. **(1)**

$R = \{(1+1, 1+1), (1+2, 1+4), (1+3, 1+9), (1+4, 1+16), (1+5, 1+25)\}$

$= \{(2, 2), (3, 5), (4, 10), (5, 17), (6, 26)\}$

Domain of $R = \{x : (x, y) \in R\} = \{2, 3, 4, 5, 6\}$ &

Range of $R = \{y : (x, y) \in R\} = \{2, 5, 10, 17, 26\}$

5. **(1)**

When $x = 1$, $y = 7 \in N$, so $(1, 7) \in R$

When $x = 2$, $y = 2+3=5 \in N$, so $(2, 5) \in R$

Again for $x = 3$, $y = 3 + 2 = 5 \in N$ so $(3, 5) \in R$

Similarly for $x = 4$, $y = 4 + \frac{6}{4} \notin N$ and for

$x = 5$, $y = 5 + \frac{6}{5} \notin N$

Thus $R =$ {(1, 7), (2, 5), (3, 5)}

Domain of $R = \{1, 2, 3\}$ and Range of $R = \{7, 5\}$

6. **(3)**

Given $3x + 4y = 5 \Rightarrow y = \frac{5-3x}{4}$

We have to find y for $x = 0, 1, \frac{2}{3}$ (by given options)

$\Rightarrow y = \frac{5}{4}$ for $x = 0$; $y = \frac{1}{2}$ for $x = 1$

and $y = \frac{3}{4}$ for $x = \frac{2}{3}$

$\Rightarrow 1R\frac{1}{2}$ and $\frac{2}{3}R\frac{3}{4}$ but $0 \not R 1$ So, ii and iii are true

7. **(4)**

$R = \{(x, y) : x$ is relatively prime to $y\}$

$= \{(2, 3), (2, 7), (3, 7), (3, 10), (4, 3), (4, 7), (5, 3), (5, 6), (5, 7)\}$

Domain of $R = \{2, 3, 4, 5\}$

8. **(3)**

$x^2 + y^2 \le 4 \Rightarrow x \in [-2, 2]$, But $x \in z$

So, $x \in \{-2, -1, 0, 1, 2\}$

9. **(1)**

We have $(x, y) \in R \Leftrightarrow x + 2y$

$= 10 \Leftrightarrow y = \frac{10-x}{2}$, $x, y \in A$

where $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

Now $x = 1$, $y = \frac{10-1}{2} = \frac{9}{2} \notin A$

This shows that 1 is not related to any element in A. similarly, we can observe that 3, 5, 7, 9 and 10 are not related to any element of A under the defined relation. Further, we find that for

$x = 2$, $y = \frac{10-2}{2} = 4 \in A$ $\therefore (2, 4) \in R$

For $x = 4$, $y = \frac{10-4}{2} = 3 \in A$ $\therefore (4, 3) \in R$

For $x = 6$, $y = \frac{10-6}{2} = 2 \in A$ $\therefore (6, 2) \in R$

For $x = 8$, $y = \frac{10-8}{2} = 1 \in A$ $\therefore (8, 1) \in R$

Thus $R = \{(2, 4), (4, 3), (6, 2), (8, 1)\}$

Hence domain of $R = \{2, 4, 6, 8\}$ and

Range of $R = \{4, 3, 2, 1\}$.

10. **(2)**

11. **(2)**

$R = \{(4, 6), (5, 6)\}$, Dom $(R) = \{4, 5\}$,
Range $(R) = \{6\}$

12. **(3)**

Number of relations from A to A; where
$A = \{2, 3, 4, 5\}$ = number of subsets $A \times A$
$= 2^{n(A \times A)} = 2^{(4)^2} = (2)^{16} = (2^4)^4 = (16)^4$

PW Web/App - https://smart.link/7wwosivoicgd4

Library- https://smart.link/sdfez8ejd80if